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AUTHOR Hansen, Jane; Pearson, P. David
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ABSTRACT

A study was conducted to determine the benefits of an approach to teaching inferential skills that combined an explicit attempt to sensitize children to why and how one should draw inferences to prior knowledge with substantial practice in drawing such inferences during story discussions. Subjects were 20 good and 20 poor fourth grade readers who were randomly assigned to either an experimental or a control group. The experimental treatment consisted of three parts: (1) making students aware of the importance of relating new information to their existing knowledge structures; (2) getting students to speculate, prior to reading, about what they would do in the protagonist's situation and to predict what the protagonist would do; and (3) getting students to answer a number of inferential questions. Students in the control group received literal/inferential questions in a pattern most often reflected in elementary school reading instruction. The results showed that poor readers tended to benefit from the instruction more than did good readers. The poor readers did not differ substantially from good readers in answering the inferential questions. The poor readers also outperformed their control group peers, indicating that the experimental teaching approach was successful. (Examples of teacher-student discussions that occurred during questioning sessions and copies of worksheet questions are appended.) (FL)

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CENTER FOR THE STUDY OF READING

Technical Report No. 235

AN INSTRUCTIONAL STUDY: IMPROVING THE INFERENTIAL COMPREHENSION OF GOOD AND POOR FOURTH-GRADE READERS

Jane Hansen
University of New Hampshire

P. David Pearson
University of Illinois at Urbana-Champaign

March 1982

University of Illinois
at Urbana-Champaign
51 Gerty Drive
Champaign, Illinois 61820

Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

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An Instructional Study:
Improving the Inferential Comprehension
of
Good and Poor Fourth-Grade Readers

Inferential comprehension is more difficult for children than literal comprehension; this assertion has been validated in a wide range of studies, using a variety of measures (Guszak, 1967; Pearson, Hansen & Gordon, 1979; Raphael, 1980; NAEP, 1981). One interesting question is whether the gap represents a simple fact about natural variation in task difficulty (inference is simply harder) or an accident of instructional history (students practice literal tasks more frequently). Some evidence exists for the instructional history argument: Hansen (1981) found that basal reader questions emphasized literal tasks, and Guszak (1967) found that teachers asked literal questions more often. Yet other evidence indicates that students have greater difficulty generating information from prior knowledge to answer a question than they do recognizing the plausibility of similarly sensible information when it is presented in a text (Pearson, Hansen, & Gordon, 1979).

Nonetheless, even if inferential tasks are inherently more difficult, it is possible that the gap between literal and inferential comprehension performance could be narrowed if inferential tasks received more instructional emphasis. Hansen (1981) set out to investigate precisely that issue. Working with average ability second grade students, she devised two treatments to improve comprehension. The first was a "practice only" approach

in the sense that the only difference between it and a "business as usual" control group--which received the traditional diet of 80% literal to 20% inferential questions typically found among questions suggested in basal manuals--was that the students in this treatment were asked only inference questions during story discussions. The second was more of a strategy training treatment. The students in this group received the same discussion questions as the control group; however, the traditional building background for the story section of the basal manual was replaced by a technique involving three steps designed to orient the students toward "an inferential set" for reading: (a) Students were asked three questions which tapped their prior experiences regarding significant aspects of the upcoming story (characters' problems, goals or motives, key actions or problem resolutions), (b) Students were asked to predict what story characters might do in similar circumstances, and (c) Having written their answers to the experience and prediction tasks on strips of paper, students wove together their strips in order to emphasize the notion that, when reading, a reader must weave together text information with prior knowledge in order to understand the text.

Hansen found, using a variety of inferential measures ranging from new questions asked about the stories in which the instruction was embedded to questions about new stories for which no instruction was provided to standardized tests, that either approach (changing question emphasis or providing students with an inferential set) improved comprehension scores generally and inference questions scores specifically. However, her data

could not discriminate between the two approaches. Hence, it remains unclear as to whether a simple change in the tasks children spend their time practicing and applying or a more complex (and instructionally more expensive--in terms of teacher time) reorientation toward reading "set" is more beneficial.

Now other researchers working on either inference tasks (Gordon, 1980) or other comprehension tasks (Raphael, 1980; Day, 1980; Brown & Palincsar, in press) have conducted training studies from which they concluded that the provision of a specific strategy students could use to go about performing the comprehension task, coupled with teacher modeling of the desired behavior and lots of interactive discussion and feedback about student performance on the same type of behavior, has led to superior levels of performance when students are given new opportunities to apply the strategy. Unfortunately, many of these studies have confounded the provision of direct teaching (the modeling and the feedback) with increased opportunity to apply the strategy. However, Day (1980) separated out sheer practice from practice accompanied by strategy training and found the additional strategy training to be beneficial.

While no causal links can be inferred, it is nonetheless interesting to note that researchers investigating comprehension instruction in classrooms (Durkin, 1978-79; Duffy & McIntyre, 1980) or in basal manuals (Durkin, 1981) have found plenty of practice (e.g., worksheet and question-answering opportunities) but little direct and specific strategy instruction.

One explicit purpose of the present research was to evaluate the beneficial effects of an approach to teaching inference skills that utilized both an explicit attempt to sensitize children to why and how one should draw inferences to prior knowledge and substantial practice in drawing such inferences during story discussions. A second major purpose of this study was to determine whether or not teachers could be trained to administer the same kind of training that experimenters had in the studies cited earlier in reference to strategy training. Because of the design, the issue of the power of separate components (strategy training versus practice) cannot be evaluated. Nonetheless, the need to replicate beneficial findings using a combined approach and the need to determine whether teachers could be trained to use the approach seemed sufficient justification for completing the work.

The present research is best viewed as an extension of the work on inference training conducted by Hansen (1981). It differs from her earlier research in several ways. First, since both strategy training and practice had proven beneficial, we decided to see what would happen if the two were combined. Hence, the single experimental treatment in this study compared the strategy training story introductions plus a heavy dose of story discussion questions requiring inferences to prior knowledge with traditional introductions plus a traditional mix of 80%/20% literal/inferential discussion questions. Second, we decided to evaluate the technique with older students (fourth rather than second grade). This change was motivated by our curiosity about the possibility that, over three and one-half years

of schooling, even a 20% frequency of inference questions is sufficient to allow children to discover how to answer such questions effectively. If such a possibility were true, then we expected to find no effect for the treatment. Third, we applied the combined treatment to both good and poor readers, with the expectation that we might find an aptitude by treatment interaction suggesting that good readers had already discovered the rules of inference game (and hence would not benefit from the experimental approach) while poor readers had not (and hence would benefit). Fourth, we decided to train teachers to apply the treatment in typical classroom environments rather than to conduct the lessons ourselves. The rationale behind this alteration is transparent: It is one thing for an experimenter steeped in the inference literature and convinced of the efficacy of the approach to apply it; it is quite another to train others perhaps not similarly inclined (and concerned with so many other curriculum demands) to develop strategies for helping students improve their inferential capabilities. A strategy no one could be expected to use, we reasoned, was hardly likely to become a candidate for instructional change.

Method

Subjects

The subjects were 40 fourth-grade students who were selected randomly from an available group of 125. All attended elementary school in a small town in Maine that included diverse SES levels. Twenty were labeled good readers and 20, poor readers based upon comprehension subtest scores of

the Stanford Achievement Test (SAT) and teacher judgment. The mean SAT equivalents were 6.3 for the good readers and 3.2 for the poor. Students within each ability group were assigned randomly into either experimental or control treatments.

Instructional Procedure

All instruction was provided during the second semester by the four certified fourth-grade teachers in that school. The teachers were switched from experimental and control conditions or vice-versa to control for any teacher differences. Instruction continued for 10 consecutive weeks, covering the next 10 stories that the children would have read anyway. A 2-week training period preceded the actual project.

Project-related activities constituted 2 instructional days each week. For the other 3 days the teachers provided the regular vocabulary and skill activities which followed the basal programs and school curriculum. Of the 2 project-related days, one was devoted to introducing the stories and the other was devoted to discussing the stories after they had been read.

On the day when the stories were introduced, each teacher followed a lesson plan provided by the experimeters. For the experimental groups these were the strategy-training sessions. The lessons began with a discussion of the virtues of using "your own life" (a phrase which the children coined after repeatedly hearing the phrase "your previous experiences") to help you understand what you read. The students discussed the importance

of continuously comparing their own experiences to those in a text in order to help their comprehension. For example:

Teacher:

What is it that we have been doing before we talk about each story?

Focus of responses:

We talk about our lives and we predict what will happen in the stories.

Teacher:

Why do we make these comparisons?

Focus of responses:

These comparisons will help us understand the stories.

Teacher:

Last week I asked you to think about a social studies lesson on Japan. Today, pretend that you are reading a science article about conversation. What might you be thinking about while you are reading the article?

Gist of responses:

Students relate personal experiences with conservation and explain how the experiences would be related to a text.

After this brief general discussion, six questions were asked which helped the students to capitalize on the use of "their own lives" in order to draw inferences that would be helpful when interpreting the upcoming story. These questions were based on a model of inferencing which claims

that persons understand new information by relating it to old (Pearson & Johnson, 1978). The six questions were based upon three important ideas which had been selected from the story. For each idea two questions were formulated. The first required the readers to relate pertinent personal experiences and the second required them to hypothesize what might happen under similar circumstances in the story. Either one of the two question types is commonly found in suggested introductions to stories in teachers' guides, but the notion of combining the two in order to more readily model the inferential process in such a graphic manner is a slightly new approach to story introductions. An example of a story introduction used in the present study follows:

An idea selected for development from one story:

Sometimes people are embarrassed by their personal appearance.

The related previous experience question:

Tell us about a time when you were embarrassed about the way you looked. (Various responses were: I got a short haircut. I'm too short. I have a suit with a big pocket in front. I wore some short pants.)

This discussion led into the following hypothesis situation:

In our next story there is an old man who is embarrassed about the way he looks. What do you think is the thing that embarrasses him? (Various answers were: Ragged clothes. Cane. Gray hair. Wrinkles.)

An important function of these questions was to stimulate interaction among the students. Often an individual would not be able to remember a related previous experience or not be able to generate an hypothesis. The interaction within the group often triggered the recall of similar experiences on the part of an individual and helped to stimulate possible hypotheses. Also, following the discussion of each question the students wrote down their own answers to the questions. Examples of materials used in all phases of the experimental group's training appear in Appendices A-D.

The lesson plans for the control groups followed suggestions in the teachers' manuals for introductions to the stories. For example,

1. The story you're going to read today is a true story about a young girl who saved the lives of many people.
2. Turn to page 265 now.
3. This story took place about 100 years ago.
4. What is the title of the story?
5. Now read pages 265-271.

On the day when the stories were discussed, the practice-only approach (from Hansen, 1981) was used with the experimental groups. They participated in a discussion composed entirely of inferential questions. For all questions some reference needed to be made to information not stated in the story in order to provide an adequate answer. An elaboration upon the story was necessary in order to answer the question thoroughly. These questions characteristically afforded several children opportunities to interact in answering any one question. For example:

In a discussion of a basal version of "Charlotte's Web," the following question was asked:

> What kind of person do you think Templeton would be if he were human?

The discussion among the students transpired as follows:

> Mean. Nasty. Cruel. Greedy. No. If Templeton were human he would be different than he was as a rat because he would have money and could buy food. Yes, I think so too, then he wouldn't have to be mean.

Notice how the interaction among the students afforded one student's variant (but plausible) interpretation to enhance the possible inferences the group might draw after reading the story. One purpose of these discussions was to develop within the students a mindset toward divergence when answering questions. It was hoped that by experiencing repeated situations of this sort, they would learn to view text as something to interpret rather than remember.

For their discussions, the control groups received a diet of literal: inferential questions in the ratio of 4:1. This ratio reflects teacher questioning patterns most commonly found in elementary reading discussions and basal reader teachers' manuals (Guszak, 1967; Hansen, 1981).

Dependent Measures

Comprehension worksheets. Following the discussion of each story all students completed worksheets containing 10 open-ended questions (students had to write answers). Six of the questions were used in later analyses, three literal and three inferential. (The answers to the other

four questions were not analyzed because these questions were not common across groups.) The literal questions could be answered by verbatim substitution of words from the text. The inferential questions could only be answered by using some world knowledge to interpret the text; the answer could not be found in the print. (An example of each question type is given in the following section.) All responses were scored as either correct or incorrect by the researchers. In cases of disagreement, the researchers resolved their differences in discussion. A positive comment was written on each student's paper by the classroom teacher. When the worksheets were returned to the children, the teachers always expressed satisfaction with the performance of the group. For the experimental groups the teachers always connected the students' success with the experimental method by stating, in various ways, that relating the stories to their own lives seemed to be helping them understand the stories.

Transfer stories at each reading level. Two stories were selected from basal materials not used in the participating school (Rand McNally and McGraw-Hill), at the reading levels appropriate for the two levels of readers (good/poor). Although direct comparisons were not made between the good and poor readers, prior knowledge assessments were taken, and the two stories were judged to be of similar familiarity. These assessments consisted of open-ended question of the type used in a previous study (Pearson, Hansen, & Gordon, 1979). At the conclusion of the study, each student read the one story appropriate for his/her reading level. Students met individually with one of two examiners, at which time the student read the

story silently and answered 16 open-ended comprehension questions, 8 of which were literal and 8 inferential. These questions were presented and answered orally.

The answers to the 16 questions were scored using two different sets of criteria. For the first analysis all answers were coded as being either correct or incorrect. The second analysis involved only the answers to the inferential questions and was a weighted scoring-scheme which reflected the quality of the answers to these inferential questions. It was based upon the following method of generating the inferential items: (a) Text segments were identified for which the two examiners agreed that the text did not provide an explanation for a situation. (b) Based upon their own knowledge of the topic, they generated what they felt was a useful explanation. (c) A question was then written that explicitly tapped the information in the explanation. (These explanations were not shown to the students; they were only written so that there would be a basis for question generation.)

The literal and inferential items are exemplified below with a section (1) of the story taken from the Rand-McNally series. The italicized portion represents the explanation added to the text in order to create inferential items. Question (2) is a literal question and (3) is an inferential question. [1]

> (1) A cat's paws are also interesting. Each paw has soft pads on it. This helps the cat walk very quietly. The claws are usually drawn up inside the paws. This way, the claws are kept hidden and sharp, and they don't make any noise when the cat

runs. When it climbs or jumps on a mouse or rat, the cat's claws come out, ready for business, so they can grab the mouse or rat.

(2) Why don't a cat's claws make any noise when the cat runs?

(3) What does it mean to say that a cat's claws come out "ready for business?"

The following five-point scale was used to weight the quality of the responses to these inferential questions. The italicized portions in parentheses are examples of students' responses to question (3).

4 - A correct answer: The answer is a reproduction of, or is synonymous to, the inserted inference statement. (*ready to tear something apart*)

3 - A correct answer: The answer is based upon the inserted inference statement but is somewhat broad, specific, or incomplete. It relies too heavily on either text or prior knowledge, rather than a balanced integration of the two. (*ready for enemies*)

2 - An incorrect answer: The answer is related to the inserted inference statement but totally omits reference to either prior knowledge or text; i.e., no inference was drawn. (*comes out of their paws*)

1 - An incorrect answer: Such as copying from other parts of the text or a "wild guess." (*they come right out like a bullet*)

0 - No response.

Common story. A common story containing 285 words was read by all students. This story was at a second-grade, second-semester reading level to ensure that it was readable by all students. The source of the story

was second-grade instructional materials (Open Court Basic Readers). The testing format was identical to those used for the reading level stories.

Results

The results were analyzed using MANOVA and ANOVA procedures. All outcome measures were analyzed separately and will be presented as independent sources of data.

Comprehension Worksheets

The data from the worksheets accompanying the stories in which the instruction was embedded were analyzed separately for the good and poor readers because the two groups of students were reading from different basals.

For the poor readers the multivariate analysis revealed a treatment effect on the question types, $F(2,17) = 5.875$, $p < .01$, $R_c = .63$ (see Table 1 for means and standard deviations). The two measures were significantly correlated (pooled within cell $r = .66$, $p < .025$), but the multivariate effect was due to the inferential variable only, as supported by the ANOVA results, $F(1,18) = 11.556$, $p < .01$ and the standardized discriminant function coefficient (Literal = -0.353, Inferential = 1.196). Thus, the experimental treatment, which focused on inferential thinking, was helpful to the poor readers when they were confronted with additional inferential questions from the instructional stories.

Insert Table 1 about here.

The experimental instruction did not facilitate the performance of the poor readers on the literal questions, $F(1,18) = 2.310$, $p > .05$. However, the experimental treatment did not induce a decrement in literal performance; in fact, these students did slightly better than the control students even though they did not practice this task frequently.

The multivariate analysis for the good readers revealed an overall treatment effect, $F(2,17) = 4.005$, $p < .05$, $R_c = .57$. The inferential and literal measures were not significantly correlated (pooled within cell $r = .39$, $p > .05$) and the multivariate effect was due to the literal variable, as supported by the ANOVA results, $F(1,18) = 6.612$, $p < .05$ and the standardized discriminant function coefficient (Literal = 1.082, Inferential = -0.510). Thus, traditional methods were successful in accomplishing traditional goals of factual memory for good readers.

The experimental treatment did not affect the performance of the good readers on the inferential questions, $F(1,18) = .064$, $p > .05$. The instruction was not effective for increasing the inferencing power of the good readers.

Results on these worksheets indicate that neither the traditional nor experimental technique is universally more effective than the other. The experimental method enhanced the inferential comprehension of the poor readers. The control method enhanced the literal comprehension of the good readers.

Stories at Each Reading Level

For this series of data the students read a transfer story (i.e., received instruction of any kind) at their own reading level; hence, there

were separate analyses for good and poor readers. The following sets of scores were analyzed: responses to inferential questions (scored as correct/incorrect and scored with the weighted scheme) and responses to literal questions (scored as correct/incorrect). MANOVA and ANOVA procedures were applied to correct/incorrect scores; only ANCVA procedures, to the weighted inference scores.

Within the poor readers the multivariate analysis revealed a treatment effect on the question types when scored with the correct/incorrect criterion, $F(2,17) = 6.417$, $p < .01$, $R_c = .66$. The two question types were correlated (pooled within cell $r = .62$, $p < .05$), but the multivariate effect was mainly due to the literal variable, as supported by the ANOVA results, $F(1,18) = 13.487$, $p < .01$ (see Table 2 for means and standard deviations) and the standardized discriminate function coefficient (Literal = 1.064, Inferential = -0.110). The results from the literal question analysis did favor the experimental group.

Insert Table 2 about here.

For the inferential questions the correct/incorrect scores did not indicate a difference between treatments for these poor readers at a conventional level of significance, $F(1,18) = 4.085$, $p = .058$. However, for the weighted inference scores there was a significant effect favoring the experimental group, $F(1,18) = 5.275$, $p < .05$. The difference within the poor readers which had been nearly significant on the correct/incorrect responses became significant when these inferential responses were coded according to the weighted scheme.

Within the good readers the multivariate analysis indicated no treatment effect for the correct/incorrect scores on the questions, $F(2,17) = .093$, $p > .05$, $R_c = .10$. These literal and inferential measures were not only highly correlated (pooled within cell $r = .73$, $p < .01$), but neither was affected by either treatment. The ANOVA performed on the weighted inference scores still did not indicate a treatment effect, $F(1,18) = .230$, $p > .05$.

The data from these stories at each reading level indicate that the poor readers who received the inferential instruction benefited from it. Their answers to both inferential and literal questions were superior to those of the students in the control group. For the good readers, there were no treatment effects.

Common Story

The story read by all readers produced the same sets of scores as did the stories at each reading level: correct/incorrect responses for the literal/inferential questions and weighted scores for the responses to the inferential questions. For each set of scores the analysis examined the main effects of ability and treatment and the interaction of the two.

For the correct/incorrect responses to the questions a two-way MANOVA produced significant main effects for both ability, $F(2,35) = 8.213$, $p < .001$, $R_c = .57$, and treatment, $F(2,35) = 6.537$, $p < .01$, $R_c = .52$; the good readers and the students in the experimental groups received higher scores. There was no interaction, $F(2,35) = 1.789$, $p > .05$, $R_c = .31$ (see Table 3 for means and standard deviations).

Insert Table 3 about here.

The follow-up univariate tests revealed the same main effects for the inferential questions using correct/incorrect scoring: ability, $F(1,36) = 15.283$, $p < .001$, and treatment, $F(1,36) = 11.479$, $p < .01$. There was no interaction, $F(1,36) = 0.000$, $p = 1.000$. High ability students performed better than low ability students; experimental students, better than control students. It is worth noting (see Table 3) that the students in the poor experimental group performed nearly as well as the good control students. The ANOVA results for the weighted inference scores revealed significant effects for ability, $F(1,36) = 6.88$, $p < .05$, and treatment, $F(1,36) = 13.162$, $p = .001$, but not for their interaction, $F(1,36) = .292$, $p > .05$. The table of means (see Table 3) suggests that the experimental treatment was about as effective for both the good and poor readers. It is interesting to note that the mean for the poor experimental readers was slightly higher than the means for the good control readers.

The ANOVA tests brought forth a slightly different pattern for the literal questions: there was an effect for ability, $F(1,36) = 10.286$, $p < .01$, but not for either treatment, $F(1,36) = .472$, $p > .05$, or the interaction of ability and treatment, $F(1,36) = 2.571$, $p > .05$.

In summary, for the common story the results suggested that the experimental readers performed remarkably well on the inferential questions. Especially interesting was the fact that the poor experimental group could answer such questions about as well as either group of good readers.

Discussion

This training in inferential comprehension is better suited to poor intermediate-grade readers than to good readers in these grades. Of the five analyses comparing good readers on inferential probes (worksheet data plus two scoring procedures for each of the other two assessments), only two (on the common story) produced a treatment effect favoring the experimental group. On the other hand, on the same five analyses for poor readers, four of the five favored the treatment group. Furthermore, the poor experimental students did not differ substantially from the good readers when answering the inferential questions on the common story even though they had SAT grade-equivalent scores 3.1 years below those good readers. Finally, on one of the three analyses of literal probes, the experimental poor readers outperformed their control group peers. By virtually any standard, then, the poor readers within the experimental group benefited from the treatment.

Why was it possible to improve low ability students' inference drawing ability? Other researchers had found that young children and/or elementary students are not only capable of drawing inferences but do so regularly in their daily lives (e.g., Paris & Upton, 1976; Paris & Lindauer, 1976). We would speculate that drawing inferences underlies most human learning. However, when children are observed in schools it quickly becomes apparent that they have difficulty drawing inferences based upon their reading assignments. In addition, observational studies (e.g., Guszak, 1967; Hansen,

1981) reveal that little instructional time is devoted to inferential thinking. Therefore, the difficulty children may have with answering inferential questions in reading classes may stem from a distinction they have drawn between everyday life and life in reading classes. Our experimental approach, then, may have legitimized a behavior that they have learned and use in other environments but avoid in encounters with text. As one student volunteered to us, "I didn't know it was O.K. to use my head to answer questions."

But the question of the treatment's peculiar benefits for poor readers persists. Perhaps teachers use differential teaching methods with good and poor readers. These students typically receive more instructional emphasis on various decoding skills and accurate word identification, with less time devoted to comprehension in general, let alone so-called higher level comprehension. Furthermore, it is not difficult to imagine differential emphasis on the kinds of questions asked of good versus poor readers. Poor readers are more likely candidates for an emphasis on getting the facts straight. Whatever the reasons, when the instruction was provided, they quickly absorbed it and used it to their advantage.

More specifically, the combination of training and practice in inferential thinking were provided. The introductions provided the opportunity to relate personal experiences and make predictions which served to make the story events more readily identifiable when students encountered them. One must remember that the predictions were often not accurate, but even so they could have served as vehicles through which students could compare

and contrast prior knowledge with text situations. It was within these introductions that the students were trained to use an inferential model of thinking. The inferential questions asked after the stories encouraged discussion and debate by eliciting multiple responses from the group. This allowed them to interact with each other and to benefit from various viewpoints. Another factor which encouraged participation was the mindset created toward divergent thinking. When more than one answer is not only acceptable, but actually expected, more students may have been willing to answer because the risk of being wrong was decreased. This mindset may have stayed with them when they had to generate responses in the more test-like conditions imposed by the posttests. Experimental students were indeed more accustomed to jumping in and generating plausible answers.

The less impressive results for the treatment with the good readers may have stemmed from the hypothetical set of circumstances suggested earlier. Good readers, because they are good, demand less attention to decoding and word identification. Also they may receive more emphasis on questions that require going beyond the text. Furthermore, good readers, again because they are good, may need little more than sheer exposure in order to figure out how to deal with a particular cognitive task. In short, the good readers in this study may have already figured out "the rules of the inference game" on their own. One other explanation is possible. These good readers were scoring at sixth grade levels on standardized tests while they were placed in fourth grade reading materials. Perhaps if they had been using more challenging and/or more unfamiliar material, the treatment

might have had a more profound effect. These possibilities await further investigation.

Another aspect of the study which became apparent during observations was a motivational factor. Poor readers who are in fourth grade know they are poor readers. They may have learned that the activities they are using in reading do not get them very far. Perhaps they tuned in to the opening comments which emphasized that this method would help their comprehension. These same opening comments may not have landed on such receptive ears in the case of the good readers (who knowing they are good readers, may not have been impressed by the expectation that this method would help their comprehension).

Other observational notes underline the possibility that motivation played an important role for the poor readers. The students in the experimental group were much more involved in their story introductions than the students in the control group. They noticeably enjoyed talking about themselves and venturing forth some possibilities about events in the stories. This created a higher level of interest in the stories than was usual for these normally reluctant readers. Imagine how impressed we as researchers were to hear the following interchange between teacher and students just as the introduction to a story was ending: The teacher uttered the usually fateful comment, "Now go and read the story." "Good!" exclaimed three of the boys as they rushed from the group.

The writing element built into the introductions appeared to help the typically restless poor readers to focus on the important ideas. If

their minds wandered they had to at least focus for a while on each question in order to write a response for it. This writing was not done in a pressure situation, so they wrote their short answers willingly, knowing it was acceptable to write a contribution given by any group member if they could not think of an original answer of their own. Because they had to write these answers, they all made at least some connections between prior knowledge and text before beginning to read.

We stated earlier that one of the major reasons for conducting this study was to determine whether this teaching method is practical. We wanted to know if this is a method that classroom teachers can use as part of their daily lesson plans. We have concluded that they can. The teachers believed in the necessity of improving inferential thinking skills and became advocates of both portions of the experimental method. The teachers indicated that they had known they were supposed to ask inferential questions frequently but that they found it more difficult to generate inferential than literal questions. Even though scripts of questions were provided, sometimes it was not easy for the teachers to sense just how much time to devote to a particular question. Inferential questioning skills may need to be practiced. Due to the training, the teachers realized the theoretical significance of assisting the students in relating the text to their own lives through the introductions. Observations indicated that conducting the introductions was easier than conducting the inferential discussions.

The motivational factor was also important to the teachers. They appreciated the higher-than-usual interest level of the students and the students' willingness to participate in the group interactions. As one teacher said, "With this method you don't have to stand on your head to keep their attention."

We are encouraged by this line of research because it seems to work and because it seems to have rather direct application to practice. Also, because our experimental methods are grounded in theoretical research, our endeavors can be interpreted as an effort to bridge the gap between basic research and the needs of students.

References

Brown, A. L., & Palincsar, A. S. Inducing strategic learning from texts by means of informed, self-control training. Topics in Learning & Learning Disabilities, in press.

Day, J. D. Training summarization skills: A comparison of teaching methods. Unpublished doctoral dissertation, University of Illinois, 1980.

Duffy, G., & McIntyre, L. A qualitative analysis of how various primary grade teachers employ the structured learning component of the direct instruction model when teaching reading. Research Series No. 80, Institute for Research on Teaching, Michigan State University, June 1980.

Durkin, D. What classroom observations reveal about reading comprehension instruction. Reading Research Quarterly, 1978-79, 14, 481-533.

Durkin, D. Reading comprehension instruction in five basal reading series. Reading Research Quarterly, 1981, 16, 515-544.

Gordon, C. J. The effects of instruction in metacomprehension and inferencing on children's comprehension abilities. Unpublished doctoral dissertation, University of Minnesota, 1980.

Guszak, F. J. Teacher questioning and reading. The Reading Teacher, 1967, 21, 227-234.

Hansen, J. The effects of inference training and practice on young children's comprehension. Reading Research Quarterly, 1981, 16, 391-417.

National Assessment of Educational Progress. Three National Assessments of Reading: Changes in Performance, 1979-80 (Report No. 11-R-01). Education Commission of the States, Denver, 1981.

Paris, S. C., & Lindauer, B. K. The role of inference in children's comprehension and memory. Cognitive Psychology, 1976, 8, 217-227.

Paris, S. C., & Upton, L. R. Children's memory for inferential relationships in prose. Child Development, 1976, 47, 660-668.

Pearson, P. D., Hansen, J., & Gordon, C. The effect of background knowledge on young children's comprehension of explicit and implicit information. Journal of Reading Behavior, 1979, 11, 201-210.

Pearson, P. D., & Johnson, D. D. Teaching reading comprehension. New York: Holt, Rinehart & Winston, 1978.

Raphael, T. E. The effects of metacognitive strategy awareness training on students' question answering behavior. Unpublished doctoral dissertation, University of Illinois, 1980.

Footnote

[1]For purposes of this experiment, we used the common distinction between literal and inferential probes (i.e., a literal question has an answer stated in the text while an inferential one does not) even though other analyses would suggest that some of these literal probes require a text-connecting inference (Pearson & Johnson, 1978).

Table 1

Means and Standard Deviations for Scores on

Questions Taken From the Instructional Worksheets

Ability		Treatment			
		Experimental		Control	
		Literal	Inferential	Literal	Inferential
Good	M	18.90	22.6	22.90	22.30
	s.d.	4.25	2.72	2.47	2.58
Poor	M	21.60	17.60	17.90	11.80
	s.d.	3.69	3.20	6.76	4.34

Table 2

Means and Standard Deviations for Scores on Questions Answered After Reading a Story Appropriate to One's Reading Level

Ability		Treatment					
		Experimental			Control		
		Score			Score		
		Lit.	Inf.	Weighted	Lit.	Inf.	Weighted
Good	M	7.10	4.80	21.90	7.00	4.90	20.60
	s.d.	1.29	1.69	5.04	.82	2.03	6.93
Poor	M	5.90	6.00	25.20	3.60	4.40	19.40
	s.d.	1.10	1.41	3.55	1.65	2.07	7.15

Table 3

Means and Standard Deviations for the Common Story

Ability		Treatment					
		Experimental			Control		
		Good	Poor	$\underline{M}_E$	Good	Poor	$\underline{M}_C$
Literal	$\underline{M}$	5.00	4.30	4.35	5.40	3.30	4.35
	s.d.	.94	1.25		1.71	1.49	
Inferential	$\underline{M}$	6.70	5.20	5.95	5.40	3.90	4.65
	s.d.	1.06	1.03		1.26	1.45	
Weighted Inference	$\underline{M}$	25.60	22.90	24.25	21.60	17.50	19.55
	s.d.	3.34	3.51		3.95	5.30	

APPENDIX A

Two Examples of Discussions Wherein the Students Focused on the Value of Using the Inferencing Process

Example 1

What is it that we have been doing before we talk about each story?
(Responses: We talk about our lives and we predict what will happen in the stories.)

Why do we make these comparisons?
(Focus of response: These comparisons will help us understand the stories.)

Last week I asked you to think about a social studies lesson on Japan. Today, pretend that you are reading a science article about conversation. What might you be thinking about while you are reading the article?
(Students relate personal experiences with conversation and explain how the experiences would be related to a text.)

Example 2

If you were reading a story about some experiences of some fourth graders on a beach party, what might you be thinking about while you were reading about their party?
(Students relate personal experiences with beach parties and explain how the experiences could be related to a story.)

Now we'll begin to think about our next story.

APPENDIX B

An Example of a Story Introduction

Used with an Experimental Group

I. Important Idea Number One:
Even adults can be afraid of things.

1. Previous Experience Question:
Tell about something an adult you know is afraid of.
2. Prediction Question:
In the story, Cousin Alma is afraid of something even though she is an adult. What do you think it is?

II. Important Idea Number Two:
People sometimes act more bravely than they feel.

1. Previous Experience Question:
Tell about how you acted sometime when you were afraid and tried not to show it.
2. Prediction Question:
How do you think that Fats, the boy in the story, will act when he is afraid and tries not to show it?

III. Important Idea Number Three:
Our experiences sometimes convince us that we are capable of doing things we thought we couldn't do.

1. Previous Experience Question:
Tell about a time that you were able to do something you thought you couldn't do.
2. Prediction Question:
In the story, what do you think Cousin Alma is able to do that she thought she couldn't do?

Seeking Adventure. A Night at Cousin Alma's. Glenview, IL: Scott, Foresman, 1973.

APPENDIX C

An Example of a Discussion Used with an Experimental Group

1. What does Mr. Kidwell mean when he says that Cousin Alma needs a hired girl "about as much as she needs 3 legs"?
2. What did Mr. Kidwell think of Lizzie Hicks?
3. About how old did Fats think Cousin Alma was when he first asked to stay at her house?
4. What makes you think Fats was part of a large family?
5. What makes you think Cousin Alma was scared when she opened the door for the boys?
6. How does Cousin Alma feel about cooking?
7. Why do you think Cousin Alma came in and tried the doors and windows?
8. How did Fats make himself feel brave?
9. How did Cousin Alma act when Lizzie came home in the middle of the night?
10. How do you think Cousin Alma will act differently in the future?

Seeking Adventure. A Night at Cousin Alma's. Glenview, IL: Scott, Foresman, 1973.

APPENDIX D

An Example of the Two Versions of Worksheet Questions Completed by Students Following Each Story

I. Version for Experimental Group

*Literal	1.	Where did the children always skate?
*Literal	2.	What happens to the wooden skates as soon as they become damp?
Strategy	3.	When people are embarrassed, they often try to hide it. Tell about a time you were embarrassed and tried not to show it.
Strategy	4.	In our story, two children are embarrassed. When were Hans and Gretel embarrassed and tried not to show it?
*Inferential	5.	Why did Hilda and Peter ask Hans to carve the necklaces for them?
Inferential	6.	Why did Dame Brinker insist that both children buy skates with the money?
*Inferential	7.	Why didn't Carl want the Brinker children to win?
*Literal	8.	Before the race began, why did Peter say the Brinkers deserved to win?
*Inferential	9.	Why did Hans insist that Peter take his strap?
Inferential	10.	What did Dame Brinker mean when she said that Hans had won more than a pair of silver skates?

II. Version for Control Group

*Literal	1.	What happens to the wooden skates as soon as they become damp?
*Inferential	2.	Why did Hilda and Peter ask Hans to carve the necklaces for them?
Literal	3.	At first, Hans said he would go without skates. What did he say the money would be spent for?
*Inferential	4.	Why didn't Carl want the Brinker children to win?
*Literal	5.	Before the race began, why did Peter say the Brinker children deserved to win the race?
*Inferential	6.	Why did Hans insist that Peter take his strap?
Literal	7.	Which race was delayed?
*Literal	8.	Where did the children always skate?
Literal	9.	Why did Gretel say Hans was the best brother in the world?
Literal	10.	How did Dame feel about Hans because he gave his skate strap to Peter?

*These questions appear on both sheets and were used as posttest data.

Kaleidoscope. A Gift for Hans Brinker. Boston, Mass: Houghton, Mifflin, 1973.